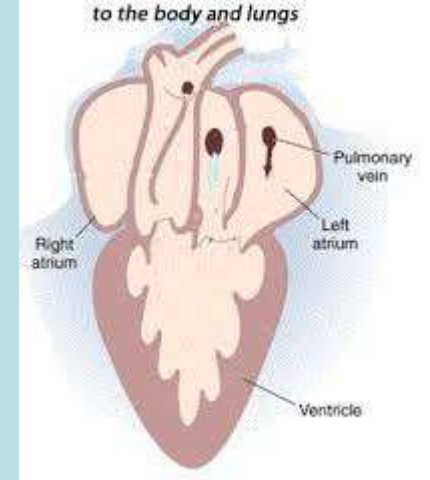


CLASSIFICATION OF AMPHIBIA

CHARACTERISTICS OF AMPHIBIA

- **Cold blooded tetrapod vertebrates**
- **Return to water to mate**
- **Shed eggs in water for external fertilization ,oviparous**
- **Eggs first evolve as aquatic larvae with external gills, then undergo metamorphosis to emerge from water as adults**
- **Youngs use gills while adults use lungs**
- **Pulmonary respiration produce 30 % of oxygen**
- **Cutaneous respiration 70% of oxygen Ectotherms**
- **thin skin (needed gas exchange), thus in danger of desiccation if removed from a moist/wet environment**
- **Amphibians gave rise to amniotes during the Pennsylvanian Period**
- **carnivorous; will eat anything they catch; no morphological specializations related to diet.**



External gills of larval salamander



Derived Characteristics

AMPHIBIA

- Single element vertebral centrum
- Bicusped, pedicellate teeth (uncalcified zone at base)
- Skull bones reduced
- Moist, scaleless (*liss* = smooth), vascular skin for respiration, 70%
- Mucous glands keep the skin moist
- Poison glands are present in the skin

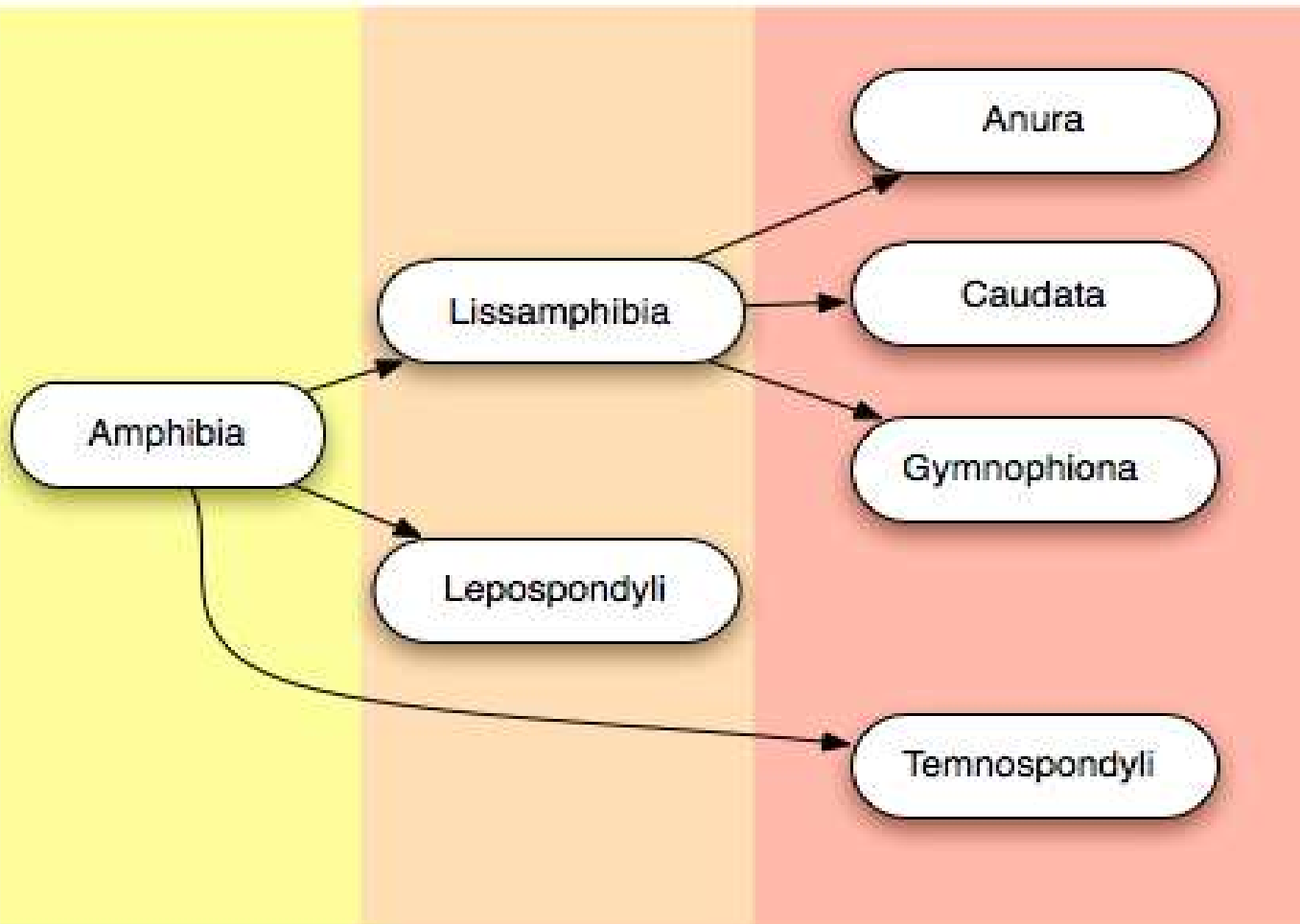
The 5500 species of amphibians are grouped into 3 orders

- **Class Amphibia**
- **Subclass Lissamphibia**
 1. **Order Caudata or Urodela** , salamanders and newt
 2. **Order Anura or Salientia**, frogs and toads
 3. **Order Gymnophiona or Apoda**) - limbless amphibians. the secretive, earthworm-like tropical caecilians

Class

Subclass

Order



ORDER URODELA [CAUDATA]

Salamanders and Newts



- 10 families and 500 species of tailed amphibians
- **middle Jurassic - Recent**
- found mainly in Northern Hemisphere (North America, Eurasia)
- In India mostly occur in the Deccan plateau
- least specialized of all living amphibians
- Elongated body
- simple primitive limbs, set at right angles to body; most have 4 limbs but a few aquatic species have only 2 limbs.
- Forelimb and hind limbs equal in size
- locomotion similar to that of primitive tetrapods--lateral bending (fishlike) with leg movement
- aquatic, semi-aquatic, terrestrial
- paedomorphosis is common in aquatic salamanders
- terrestrial salamanders live in moist places under stones and rotten logs, usually not far from water.

Respiration

- all salamanders hatch with external gills, but during development, they are lost in all except aquatic forms or in some species which do not undergo complete metamorphosis.
- most terrestrial salamanders have well-developed, but simple lungs.
- salamanders lack ribs
- amphibians use positive pressure from hypobranchial apparatus of buccal pump to force air into lungs
- Cutaneous respiration
- The skin contains an extensive vascular network of capillaries which allow for gas exchange to take place just below the epidermis.
- Cutaneous respiration is facilitated by pumping air in and out of the mouth where further respiratory gas exchange can take place.
- The buccal (mouth) cavity has a highly vascularized membrane system that supplements cutaneous respiration in lungless, gill-less salamanders.

Breeding

- Most salamanders use internal fertilization.
- The female picks up a packet of sperm (spermatophore usually deposited by the male on the substrate).
- Some aquatic salamanders (Cryptobranchidae, Hynobiidae, Sirenidae) use external fertilization
- aquatic species lay their fertilized eggs in small, group-like clusters in the water.
- Larvae have external gills and a fin-like tail
- Terrestrial species lay masses of eggs under logs or in holes of soft dirt. Many species remain near eggs to guard them. direct development--bypass the aquatic larval stage and hatch as miniature adults.
- most complex life cycle in some American newts. Often have a terrestrial stage interposed between the aquatic larvae and the secondarily aquatic, breeding adults (*Notophthalmus viridescens*: Family Salamandridae).

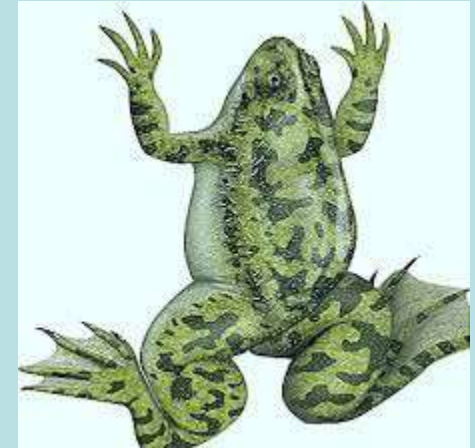
ORDER ANURA

Frogs and toads

- 27 families and 4900 species
- Distribution - cosmopolitan (except Antarctica)
- Jurassic - Recent specializations for jumping
 - long hind limbs and toes
 - proximal bones of tarsus elongate.

Pelvic girdle enlarged, strengthened and anchored to vertebral column

- ilium elongated
- the caudal vertebra are fused into a solid rod, the urostyle
- Vertebral column short and inflexible [9 or fewer (usually 5) pre-sacral vertebrae]
- lack a visible neck
- ribs highly reduced, usually fused to the vertebrae



Habits and Habitats

- **Locomotor modes** - forelimb length vs. hind limb length in walkers, hoppers, burrowers, jumpers, and swimmers
- Body form reflects specializations for different habitats
- "Frog" refers to several families of mainly aquatic anurans with aquatic specializations such as webbing on the feet
-
- Toad refers to several families of terrestrial anurans.
- Toads differ from frogs in that toads have
 - shorter fore- and hind limbs, stout, compact bodies, thicker skin
 - usually, skin is covered with prominent "warts" or "bumps (overall rough appearance and texture) etc.
 - little or no webbing on feet

Characters

- **Size**
 - The largest frog is the West African *Gigantorana goliath*. > 30 cm
 - The smallest frog recorded is approx. 1 cm long found in Cuba.
 - Largest American frog is the bullfrog (*Rana catesbiana*) (20 cm body length)
- **Defense:**
 - Poison glands in non-sedentary frogs
- **Feeding**
 - Many have sticky tongues that can be flipped out

Characters

- Reproduction
 - The typical frog life cycle:
 - amplexus for hours to days external fertilization masses of fertilized eggs in the water hatching limbless, gill-bearing tadpole larvae: feed and grow transformation (metamorphosis) hind legs appear and gradually lengthen. The tail shortens; larval teeth are lost; gills are replaced by lungs. Eyelids develop and forelegs emerge. In a matter of weeks or less the aquatic tadpoles has completed its metamorphosis to an adult frog.
 - internal fertilization in some via cloacae--*Ascaphis truei* and others that lay eggs on land



Characters

- Arboreal frogs eggs laid over water-tadpoles drop into water [*Centrolenella*]
- Eggs in a nest of foam that floats on the water [*Physalaemus*]
- Tadpoles carried by adult--male *Rhinoderma darwini* [Darwin's frog] pick up eggs carry tadpoles in vocal pouch
- Tadpoles of poison dart frogs carried on back of adult male [Phylobates] or female [*Colostheus*]; in pouch on back of female *Flectnotus* [marsupial frog]
- *Hemiphractus* a hyliid carries eggs on its back
- *Pipa* [Surinam toad]: fertilized eggs sink into brooding pouches in the softened skin of female
- Tadpoles are carried in stomach of Australian *Rheobatrachus*
- Tree frog eggs in bromeliads
- Males of two microhylid species transport their offspring on their backs. "They travel up to 55 meters over nine days, dropping the fully formed baby frogs –no tadpole stage - at different spots along the journey.
- This behavior may avoid inbreeding and create less competition for the next generation."

Characters

- They prey on worms, insects, and small mollusks.
- Some species have no lungs and depend entirely on cutaneous respiration. mudpuppy (*Necturus*) and the axolotl (*Ambystoma*), retain the larval gills as adults.
- They differ from the Caudates by having a more complex skeletal system with stronger limbs and developmental metamorphosis (from a tailed and limbless polliwog to a tailless limbed adult).
- Anurans are most successful in their terrestrial habitats (including trees).

ORDER GYMNOPTIONA [APODA] (early Jurassic - Recent) caecilians (caecus, blind).

Gymnophiona (naked snake). **160 species of worm-like amphibians.**

Found in tropical forests of South America (primarily), Africa, and south-east Asia.

- Limbless
 - an early Jurassic caecilian possesses limbs
- Mostly burrowing species, some aquatic
- Solidly built skull
- Long, slender--body up to 200 vertebra
- No postanal tail
- Caecilians are wormlike creatures found in tropical forests.
- They burrow through the soft soil searching for worms and other invertebrates. Very rarely seen due to their burrowing nature.
- Adapted to subterranean habits:
- Almost totally blind (atrophied eyes are hidden under the skin),
- Have sensory tentacles.
- Skin is annulated, and some have minute dermal scales.
- Coloration is drab.

